Effective Treatment of Decompression-Related Spinal Cord Injury with a Novel Hyperbaric Oxygen Treatment: A Case Report

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A 64-year-old male, who was an expert scuba diver, suffered decompression sickness upon accidentally ascending from a 220-foot dive in less than two minutes instead of the planned 45 minutes. He initially required emergent treatment for severe cardiopulmonary and gastrointestinal symptoms. As these conditions improved, it became clear that he had sustained a spinal cord injury (SCI). His spinal cord perfusion pressure was compromised by inert nitrogen gas bubbles that settled in his blood vessels and tissues as a result of the decompression pathology. MRI demonstrated ischemic-type abnormalities at C2-7, T3-4 and T7-8.1

Medical management included a two-week course of hyperbaric oxygen (HBO) recompression therapy. Air pressure and oxygen levels in the chamber were increased in an attempt to facilitate the safe escape of injurious bubbles from the patient’s body. By post-injury day 4, however, his neurological status had not yet stabilized. He was then taken for an unprecedented 53-hour HBO session with pressures simulating a depth of 165 feet. Additional treatments involved one to two hours at pressures simulating depths of up to 100 feet. Traditional treatments, by contrast, last an hour at pressures simulating depths of less than 60 feet.3

Prior to his prolonged and deep HBO treatment, this patient was able to weakly shrug his shoulders and had patchy sensation in the left upper limb. Afterward, his motor and sensory function steadily improved. At one week post-injury, his American Spinal Injury Association Impairment Scale (AIS) classification was C6-B, or sensory incomplete. That is, he had sensation but demonstrated no reliable motor function in his shoulders, elbows and wrists.

On day 14, he was admitted to an acute rehabilitation unit. He made impressive functional progress as he worked with the SCI rehabilitation team. At six weeks post-injury, his AIS classification was T1-C, or motor incomplete, meaning he had consistent motor and sensory function throughout his upper limbs. Upon discharge from rehabilitation, he could move his upper and proximal lower limbs and had intact sensation in most dermatomes. He was able to self-propel a manual wheelchair but was unable to transfer from a bed to a chair independently because of chronic shoulder issues that limited his ability to bear weight. Once in a chair, however, he was independent with upper body activities.

The patient was discharged to another rehabilitation facility closer to his home eight weeks post-injury and continued his recovery there. One year later, he is active in his community and has returned to his teaching job part-time. He uses a wheelchair for mobility as well as other adaptive devices.

Discussion
Ischemic SCI in divers who develop decompression sickness during rapid ascent is often catastrophic. Survival and recovery are not assured even with widely accepted treatment protocols.4 In this case, prolonged and deep HBO therapy helped treat this patient’s injury in a manner that, to our knowledge, has not been previously described. MM

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REFERENCES